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GUIDE TO GOOD PRACTICES FOR CONTROL OF EQUIPMENT AND SYSTEM STATUS



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Guide to Good Practices for Control of Equipment and System Status

Page / Section	Change
p. 10 / Section 4.3 / second paragraph	The reference to DOE-STD-1030-92 was updated to the current document—DOE-STD-1030-96.
p. 12 / Section 4.6 / first paragraph	The reference to DOE Order 4330.4A was updated to the current document—DOE Order 4330.4B.
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Concluding Material	The Preparing Activity was changed from NE-73 to EH-31.

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FOREWORD

The purpose of this Guide to Good Practices is to provide Department of Energy (DOE) contractors with information that can be used to validate and/or modify existing programs relative to Conduct of Operations. This Guide to Good Practices is part of a series of guides designed to enhance the guidelines set forth in DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*.

KEYWORDS

Operations Supervisor

Round Sheet

Status

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DEFINITIONS

Caution Tag	Tag used to indicate some precaution or item of information that must be known prior to operating a component or system. Caution tags may be used on functional components or systems. Caution tags are NOT to be used for protecting personnel (i.e., do not use caution tags where it is appropriate to use a danger tag and lockout device).
Log (Narrative Log)	A chronological narrative record of events or functions.
Operations	The business activity of the facility and assigned personnel, e.g., controlling process equipment, producing/assembling components, performing tests, conducting experiments, processing information, etc.
Operations Supervisor	The individual having authority and responsibility for operational control of a facility, process, experiment, or other project.
Round Sheet (Round Inspection Sheet)	A type of data-collection sheet used to record key equipment and system parameters (e.g., readings from instruments and gauges) and operating status (whether operating or shutdown for maintenance or repair) during equipment inspection tours (rounds).
Shift	The normal period of work for an individual or group (e.g., 8:00 a.m. to 5:00)
Status	The operational condition or state of readiness of equipment or systems (e.g., on-line, standby, unavailable).

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Surveillance

A test, calibration, or inspection that ensures the necessary operability and quality of safety-related items required for safe operation of a facility.

GUIDE TO GOOD PRACTICES FOR CONTROL OF EQUIPMENT AND SYSTEM STATUS

1. INTRODUCTION

This Guide to Good Practices is written to enhance understanding of, and provide direction for, Control of Equipment and System Status, Chapter VIII of Department of Energy (DOE) Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*. The practices in this guide should be considered when planning or reviewing equipment and system status control programs. Contractors are advised to adopt procedures that meet the intent of DOE Order 5480.19.

"Control of Equipment and System Status" is an element of an effective Conduct of Operations program. The complexity and array of activities performed in DOE facilities dictate the need for a formal status control program to promote safe and efficient operations.

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2. OBJECTIVE

The objective and criteria are derived from DOE Order 5480.19. They are intended to aid each facility in meeting the intent of the order.

Facility configuration is properly maintained by methods that control equipment and system status.

Criteria:

- a. The operations supervisor maintains proper facility configuration, including authorizing changes to equipment and system status.
- b. A system is in place to ensure and document proper alignment of equipment and systems prior to placing them in service.
- c. A lockout/tagout program is in place to provide protection to personnel and equipment and to aid in the control of equipment and system status.
- d. Administrative controls are established to document compliance with operational limits.
- e. Operating personnel receive accurate information reflecting the status of control panel and local panel alarms.
- f. A system is in place to document equipment deficiencies.
- g. All activities (including maintenance) on equipment that are important to safety, that affect operations, or that change control indications or alarms, are properly analyzed, documented, and authorized.

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- h. Operational testing is performed following maintenance to demonstrate that equipment and systems are capable of performing their intended function.
- i. A system is in place to control temporary modifications to facility equipment or systems.
- j. A document control system is in place that ensures operating personnel have the latest revision to documents necessary for proper control of equipment and systems.

3. DISCUSSION

DOE facilities are required to establish administrative programs to control equipment and system status. A program for controlling equipment and system status, or status control, must be broad in scope. It should incorporate measures to ensure awareness by operating personnel concerning the physical configuration and operating status of equipment and systems. It should contain methods to maintain system operability in accordance with design requirements. DOE Order 5480.19 addresses several individual programs that comprise portions of the status control program, including Lockouts and Tagouts (Chapter IX), Independent Verification (Chapter X), Logkeeping (Chapter XI), and Operations Turnover (Chapter XII). These programs assist in establishing effective control of equipment and system status and are appropriately referenced within this guide.

Proper control of equipment and systems requires clear lines of responsibility and authority. The facility status control program should clearly designate the authority and responsibility for controlling status to ensure proper configuration. All personnel must understand the importance of keeping the operations supervisor and other designated operations personnel informed of activities that could affect the status or operability of equipment.

Effective control of equipment and system status also means coordinating operations and maintenance activities. Equipment deficiencies must be promptly identified for correction in the work control system. Locking and tagging should be performed by qualified operations personnel to ensure that all energy and hazardous material sources are properly isolated, and required safety functions are not inadvertently disabled. The operations supervisor should sign the work control documents to authorize the start of all maintenance activities, including testing, calibration, and related activities. A process for post-maintenance testing should be in place to ensure that all operation of equipment is controlled by approved operating procedures and that appropriate maintenance and operations personnel are represented during the testing. The status or alignment of equipment should be verified as part of restoring the equipment to service following outages for maintenance or design modifications.

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Special administrative controls are required whenever equipment must be operated with temporary modifications (e.g., jumpers, blocks, bypasses) in place. These controls should include methods for ensuring that operators are aware of the modified status of the equipment and its operating limitations. The controls should provide for appropriate safety and technical reviews, documentation, updating of procedures and drawings, and training.

The status control program requires specific methods for verifying and documenting the configuration of equipment and systems, changes in equipment status, and compliance with operational and safety limits. Status control documentation may include checklists, logs, status boards, or a combination of these. Requirements for status control documentation should be coordinated with other documentation requirements (e.g., logkeeping) to avoid unnecessary forms or duplication of information. This ensures that status information is updated as a regular part of the job, not treated as an added administrative task. It also provides those personnel having operating responsibility with simple, direct access to current status information.

4. GOOD PRACTICES

4.1 Status Change Authorization and Reporting

An effective program for control of equipment and system status must be based upon the designation of responsibility for status control and authority to effect status changes. During the operation of any facility process or project, there must be one individual who is responsible for operational control and who has authority to make changes. Within this guide, that person will be referred to as the operations supervisor.

The operations supervisor is typically the senior operating person present. The supervisor is tasked with maintaining a broad perspective of all facility operations; however, when abnormal or emergency conditions occur, the supervisor's response must be based on current knowledge of system status. Therefore, changes in the status of safety-related systems or other equipment critical to the operation of the facility should be pre-authorized by the operations supervisor.

This means that the supervisor's perspective of status must be the focal point for all operations. Status updates to the supervisor may be required, even for actions that have already been authorized. For example: during the morning shift briefing, a supervisor gives instructions for operational testing of a control system, to be performed later during that shift. In the afternoon, when the operator or technician is ready to begin the test, it is appropriate to check back with the supervisor, both to verify that the process or equipment status still supports the test, and to inform the supervisor of the current status.

To facilitate operation of equipment or processes, the operations supervisor may delegate the authority to operate and make status changes in systems or equipment that are not critical to facility safety or process output. When delegating authority to operate, the supervisor must also ensure that all pertinent operating information is provided to the designated operator in charge. Each designated operator must ensure that the supervisor is periodically updated on the status of the delegated systems.

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The operations supervisor should ensure that all facility personnel are aware of the potential impact their activities may have on the status of equipment and systems, and that they obtain concurrence prior to beginning work that could change the status of equipment. Any status changes that occur during the progress of work should be reported to the responsible operator or the operations supervisor. Additional guidance concerning the reporting of process- and status-related information is contained in DOE Order 5480.19, Chapter XIII, "Operations Aspects of Facility Chemistry and Unique Processes."

4.2 Equipment and System Alignment

Operations personnel should be aware of the alignment of systems and equipment within their area, whatever the current mode of operation (i.e., startup, shutdown, normal operations, or maintenance). Alignment checklists should be developed for all modes of operation and incorporated into the appropriate procedures. These checklists should be used as guides for operators to use in establishing the correct component positions when placing systems and equipment into service or other operating modes. They should identify each component by the exact name and identifying number that appears on the component label. They should identify the required alignment position (e.g., open, shut, on, off), make provision for signature or initials verifying the component position, and provide space to annotate any deviation.

The frequency for performing or verifying system alignments depends on the level of control required and the level of operating activity. For example, if a system has minimal impact on safety or process output, and is maintained in a steady-state operating mode (e.g., normal operation, standby) with few changes in component status, then it may not be necessary to perform complete or frequent alignment checks. However, if a system is critical to safety or process output, or is constantly undergoing component status changes (e.g., valve manipulations), then more frequent alignment checks would be appropriate.

Equipment and system alignment should be verified following any maintenance activity, including testing, if the activity could have placed components in a position other than that

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required for normal operation. Functional testing prior to startup, and periodic surveillance during operation, may be required for equipment that is subject to technical safety requirements. Techniques for verifying component positions and additional information concerning verification requirements are contained in DOE Order 5480.19, Chapter X, "Independent Verification."

When alignment checklists have been completed, they should be signed and approved by the operations supervisor. Completed checklists serve as documentation of the system and equipment status and provide a basis for verification. They should be retained in an accessible location until the next time the checklist is completed, at which time the superseded checklist may be filed.

A system to track deviations from the normal alignment should be established. One method commonly used for this purpose is the status board. Status boards typically contain a graphic or schematic representation of the system, or a listing of system components. When status changes are made, the status board is annotated to indicate the current status of equipment. The status board (or other tracking system) should be promptly updated when a change to system or equipment alignment occurs. In addition, all status changes should be documented in the narrative log. DOE Order 5480.19, Chapter XI, "Logkeeping" provides additional information for maintaining narrative logs.

The status board or other tracking system should be controlled by the operations supervisor and designated system operators. The status control information recorded in the narrative logs and reflected in updates to the tracking system should be incorporated into the operations turnover process. DOE Order 5480.19, Chapter XII, "Operations Turnover," identifies elements of an effective turnover.

4.3 Equipment Locking and Tagging

Locking and tagging, or lockout/tagout, is a program for removing equipment from service and establishing administrative controls to prevent its operation. It is used to ensure the safety of workers performing maintenance or testing, and may be used for other purposes

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requiring that the equipment be deenergized and inoperable. Lockout/tagout is applied after equipment has been isolated from energy and hazardous material sources by placing danger tags, or locks and tags, on the isolation devices to ensure that energy cannot be restored.

Because lockout/tagout changes the operational status of the affected equipment, lockout/tagout activities should be approved by the operations supervisor. All personnel should receive training on the requirements of the facility lockout/tagout program and their individual responsibilities under the program. All personnel must understand that operation or manipulation of equipment under lockout/tagout control is strictly forbidden. Additional information concerning lockout/tagout requirements is contained in DOE Order 5480.19, Chapter IX, "Lockouts and Tagouts," and in DOE-STD-1030-96, *Guide to Good Practices for Lockouts and Tagouts*.

4.4 Operational Limits Compliance

Those facilities subject to technical safety requirements must establish administrative controls to ensure proper adherence to operational limits (also known as limiting conditions for operation). These operational limits are usually expressed as specific conditions (e.g., a redundant pump is not operable) requiring specific response actions (e.g., load reduction). The operations supervisor should direct, or be aware of, all actions that are taken in response to the operational limit requirements or actions to mitigate adverse consequences to the facility. All appropriate personnel should be informed of the operational limit requirements. All personnel having responsibility for actions under operational limits should periodically review the conditions for operation and ensure that the appropriate actions are performed.

Facilities must document compliance with operational limits. One method is to initiate a tracking document or file each time a designated condition is encountered. The file should include information from logs, alignment checklists, turnover checklists, or other documentation to indicate the initial conditions and circumstances that resulted in restricting operations. All actions taken in response to the operational limit requirements and other

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actions to mitigate the consequences to the facility should be documented. When normal operations are again permitted, the tracking document or file can be used to evaluate the event.

4.5 Alarm Status

Reliable, up-to-date information on the status of important processes and systems is essential to the safe and reliable operation of any facility. Much of this information is transmitted to the operator by control panel or local panel meters, gauges, alarms, etc. Checking the status of indicating devices and alarms should be part of each operator's routine inspection tours (rounds). Performance of operator rounds and response to alarm actuation are discussed in greater detail in DOE Order 5480.19, Chapter II, "Shift Routines and Operating Practices."

Alarm systems provide a valuable backup to the operator's monitoring and control of system status. But, just like the systems they monitor, alarms require periodic maintenance and are subject to breakdown. It is therefore important that operators know the status of alarms in their areas of responsibility. Facilities should include within their program for control of equipment and system status, measures to ensure that personnel are aware of the status of alarms. The following specific areas should be addressed:

- C Alarms that are totally disabled should be identified to operators through the tagout program, if applicable, or through the use of deficiency stickers, color coding of alarm windows, or other positive means of identification. Instructions for operating personnel should be provided to ensure that equipment parameters are more closely monitored by operators during the period when alarm indication is not available.

- C Alarms with individual inputs disabled should be identified to operators and documentation should be available reflecting the changed alarm characteristics. Additional monitoring of equipment parameters is needed for those items that are not capable of actuating the alarm. For example, a particular alarm is designed to receive

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inputs for system pressure and temperature, and actuate if either is out of specification. If the temperature input to the alarm is disabled, the operator must monitor the system temperature more closely to compensate for the lack of alarm capability.

- C Alarms with temporarily changed setpoints should be documented for operator reference, and may be further identified by color coded alarm windows or other positive means.
- C Alarms that are lighted during normal operation should be identified by color coded alarm windows, distinctive labeling, or other positive means.
- C Alarms that may be activated by more than one input, but that do not reflash when subsequent inputs are received, should be identified within the alarm response procedures and operator training. Operator training and operations procedures should specify when operators should perform additional equipment parameter monitoring to ensure that abnormal conditions are not masked by alarms that do not reflash.
- C Procedures for response to alarm actuation should be controlled and updated to reflect any changes in alarm status. Changes in the alarm status should be transmitted to all activities that may be affected, e.g., training, systems engineering, temporary modification interfaces, etc..

4.6 Equipment Deficiency Identification and Documentation

When equipment deficiencies are discovered, the supervisor should be notified. Then, two distinct actions should be taken. First, the deficiency should be documented and identified for correction in accordance with the facility's work control system. Guidelines and information related to work control systems are contained in DOE Order 4330.4B, *Maintenance Management Program*.

Second, the deficiency should be communicated to other affected personnel. One method is through the use of a deficiency tag. A deficiency tag may be attached to the affected component by operating personnel or others to indicate that a component deficiency has been recognized, documented, and reported in accordance with facility procedures. When the deficiency has been corrected, maintenance personnel should remove the tag. Other methods for communicating deficiencies to affected personnel include caution tags, narrative logs, turnover checklists, round sheets, annotated status boards, etc. Facility policies should specify the method(s) to be used to inform personnel of deficiencies in the equipment they operate and monitor.

4.7 Work Authorization and Documentation

All activities that change the status of systems or equipment important to safety, that affect operations, or that change control indications or alarms, should be authorized by the operations supervisor. These activities may include maintenance, testing, fuel movement, radiography, and others. The authorization should be documented in the work control package.

Organizations and individuals performing work should provide status reports on the work in progress to the operations supervisor. The facility should have a system in place to ensure that status information is provided to the operations supervisor when work is performed by outside personnel (e.g., vendors). The operations supervisor should make these status reports available to all applicable personnel. This permits coordination of interrelated activities among work groups.

4.8 Equipment Post-Maintenance Testing and Return to Service

Before returning equipment to service following maintenance, the equipment should be tested to demonstrate that it is capable of performing its intended function. Two purposes are served by this: the testing should verify that the maintenance was performed correctly

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[i.e., it corrected the original problem(s)]; it should also prove that no problems were introduced as a result of the maintenance activities.

The maintenance work control package or maintenance procedure should specify the type and duration of post-maintenance testing required. For some facilities, the specific requirements to prove operability of safety-related systems are identified in Technical Safety Requirements (e.g., Technical Specifications, Operational Safety Requirements, etc.). An engineering evaluation should determine whether additional testing or different methods are required whenever the scope of work is changed, e.g., when additional work is performed to correct a previously undisclosed problem that is discovered during maintenance. All equipment functions that may have been affected by the maintenance should be tested.

Operation of the equipment for testing should be performed by qualified operations personnel in accordance with approved procedures. Maintenance personnel should monitor the testing. The operations supervisor is ultimately responsible for ensuring that the testing proves the operability of the equipment.

4.9 Temporary Modification Control

Facilities should establish administrative control systems for approving, installing, and monitoring temporary modifications. Temporary modifications may include electrical jumpers, lifted leads, pulled circuit boards, disabled annunciators or alarms, mechanical jumpers or bypasses, temporary setpoint changes, installed or removed blank flanges, disabled relief or safety valves, installed or removed filters or strainers, plugged floor drains, and temporary pipe supports.

Prior to installing the temporary modification, the administrative control system should provide for the following activities:

- C Communicate the proposed modification to the design authority to allow for evaluation of the modification's impact on current design activities and system characteristics,

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approval of the design modification by the design authority, and technical oversight of the installation.

- C Perform and document appropriate safety reviews, and obtain all necessary concurrences for approval of the modification.
- C Update operating procedures, drawings, and documents as required, and conduct briefings and any necessary training.

The administrative control system should provide for independent verification of correct installation. Additional information pertaining to independent verification can be found in DOE Order 5480.19, Chapter X, "Independent Verification." Periodic audits should be performed to evaluate the status of all outstanding modifications. Independent verification should be performed upon removal of the modification to ensure that all systems and equipment are returned to their normal configuration.

4.10 Distribution and Control of Equipment and System Documents

It is imperative that personnel have and use up-to-date system and equipment documents (e.g., drawings, procedures). A system must be in place to ensure that the correct documents are available and maintained in a location that is accessible during all hours of operation. The system should ensure that document changes or revisions are promptly communicated to appropriate personnel (e.g., operations personnel, testing and maintenance groups, safety analysis groups, procedure review groups, and quality assurance groups).

One method to inform personnel of changes or revisions is using the programs for required reading and timely orders to operators. Required reading can provide a means for personnel to read updated procedures. Timely orders to operators are used to alert personnel to changes in the procedures, equipment, or priorities for operation. For guidance on these programs, refer to DOE Order 5480.19, Chapter XIV, "Required Reading;" Chapter XV, "Timely Orders to Operators;" and DOE-STD-1033-92, *Guide to Good Practices for Operations and Administration Updates Through Required Reading*.

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SUPPLEMENTAL RESOURCES

The following sources provide additional information pertaining to topics discussed in this Guide to Good Practices.

DOE Order 4330.4B, *Maintenance Management Program*.

DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, Chapter II, "Shift Routines and Operating Practices."

DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, Chapter IX, "Lockouts and Tagouts."

DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, Chapter X, "Independent Verification."

DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, Chapter XI, "Logkeeping."

DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, Chapter XII, "Operations Turnover."

DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, Chapter XIII, "Operations Aspects of Facility Chemistry and Unique Processes."

DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, Chapter XIV, "Required Reading."

DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, Chapter XV, "Timely Orders to Operators."

DOE-STD-1030-96, *Guide to Good Practices for Lockouts and Tagouts*.

DOE-STD-1033-92, *Guide to Good Practices for Operations and Administration Updates Through Required Reading*.

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CONCLUDING MATERIAL

Review Activities:

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